Amendments to the Claims

The following listing of claims will replace all prior versions, and listings, of claims in the present application:

1-33. (Canceled)

34. (Original) A system for actively damping boom noise comprising:

an enclosure defining a plurality of low-frequency acoustic modes;

an acoustic wave sensor positioned within said enclosure, wherein said acoustic wave sensor is configured to produce an acoustic wave sensor signal representative of at least one of said plurality of low-frequency acoustic modes;

a motion sensor secured to a panel of said enclosure, wherein said motion sensor is configured to produce a motion sensor signal representative of at least one of said plurality of low-frequency acoustic modes;

an acoustic wave actuator substantially collocated with said acoustic wave sensor and positioned within said enclosure, wherein said acoustic wave actuator is responsive to a first electronic feedback loop output signal and a second electronic feedback loop output signal;

a first electronic feedback loop defining an acoustic damping controller, wherein said acoustic damping controller defines a first electronic feedback loop input coupled to said acoustic wave sensor signal and a first electronic feedback loop output, wherein said first electronic feedback loop is configured to generate said first electronic feedback loop output signal by applying a feedback loop transfer function to said acoustic wave sensor signal, wherein said feedback loop transfer function comprises a second order differential equation including a first variable representing a predetermined damping ratio and a second variable representing a tuned natural frequency, said second variable representing said tuned natural frequency is selected to be tuned to a natural frequency of at least one of said plurality of low-frequency acoustic modes, said feedback loop transfer function defines a frequency response having a characteristic maximum gain substantially corresponding to the value of said tuned natural

frequency, wherein said feedback loop transfer function creates a 90 degree phase lead substantially at said tuned natural frequency; and

a second electronic feedback loop defining a vibro-acoustic controller, wherein said vibro-acoustic controller defines a second electronic feedback loop input coupled to said motion sensor signal and a second electronic feedback loop output, and wherein said second electronic feedback loop is configured to generate said second electronic feedback loop output signal by applying said feedback loop transfer function to said motion sensor signal.

35. (Original) A system for actively damping boom noise as claimed in claim 34 wherein said motion sensor signal comprises an electric signal indicative of measured acceleration detected by said motion sensor as a result of structural vibration of said panel, said acoustic wave sensor signal comprises an electric signal indicative of measured resonance detected by said acoustic wave sensor within said enclosure, and said first and second electronic feedback loop output signals are representative of a rate of change of volume velocity to be produced by said acoustic wave actuator.

36. (Original) A system for actively damping boom noise as claimed in claim 34 wherein said motion sensor signal comprises an electric signal indicative of measured acceleration detected by said motion sensor as a result of structural vibration of said panel, said acoustic wave sensor signal comprises an electric signal indicative of measured resonance detected by said acoustic wave sensor within said enclosure, and said first and second electronic feedback loop output signals are representative of a rate of change of volume velocity to be produced by said acoustic wave actuator, and wherein

said feedback loop transfer function is as follows:

$$\frac{V(s)}{P(s)} = C\frac{s^2}{s^2 + 2\zeta\omega_n s + \omega_n^2} \qquad (1)$$

where the units of $V(s)$ corresponds to said rate of change of volume velocity, $P(s)$ corresponds to the pressure at the location of said acoustic wave actuator and said acoustic wave sensor, s is a Laplace variable, ζ is a damping ratio, ω_n is said tuned natural frequency, and C is a constant representing at least one of a power amplification factor and a gain value.

37. (Original) A system for actively damping boom noise as claimed in claim 34 wherein said motion sensor signal comprises an electric signal indicative of measured acceleration detected by said motion sensor as a result of structural vibration of said panel, said acoustic wave sensor signal comprises an electric signal indicative of measured resonance detected by said acoustic wave sensor within said enclosure, and said first and second electronic feedback loop output signals are representative of a rate of change of volume velocity to be produced by said acoustic wave actuator, and wherein said feedback loop transfer function is as follows:

$$\frac{V(s)}{P(s)} = -C\frac{\omega_n^2}{s^2 + 2\zeta\omega_n s + \omega_n^2} \qquad (2)$$

where the units of $V(s)$ corresponds to said rate of change of volume velocity, $P(s)$ corresponds to the pressure at the location of said acoustic wave actuator and said acoustic wave sensor, s is a Laplace variable, ζ is a damping ratio, ω_n is said tuned natural frequency, and C is a constant representing at least one of a power amplification factor and a gain value.

38. (Currently amended) A system for actively damping boom noise as claimed in claim 34 wherein said motion sensor signal comprises an electric signal indicative of measured acceleration detected by said motion sensor as a result of structural vibration of said panel, said acoustic wave sensor signal comprises an electric signal indicative of measured resonance detected by said acoustic wave sensor within said enclosure, and said first and second electronic feedback loop output signals are representative of a rate of change of volume velocity to be

produced by said acoustic wave actuator, and wherein said feedback loop transfer function is as follows:

$$\frac{V(s)}{P(s)} = C\frac{s^2 + 2\zeta_s\omega_{ns}s + \omega_{ns}^2}{s^2 + 2\zeta\omega_n s + \omega_n^2} \qquad (3)$$

where the units of $V(s)$ corresponds to said rate of change of volume velocity, $P(s)$ corresponds to the pressure at the location of said acoustic wave actuator and said acoustic wave sensor, s is a Laplace variable, ~~ζ and ζ are damping ratios, ω_n and ω_n are said tuned natural frequencies~~ ζ is a damping ratio of the controller, ζ_s is a damping ratio of the acoustic wave actuator, ω_n is a tuned natural frequency, and ω_{ns} is a natural frequency of the acoustic wave actuator, and C is a constant representing at least one of a power amplification factor and a gain value.

39. (Original) A system for actively damping boom noise as claimed in claim 34 wherein said motion sensor signal comprises an electric signal indicative of measured acceleration detected by said motion sensor as a result of structural vibration of said panel, said acoustic wave sensor signal comprises an electric signal indicative of measured resonance detected by said acoustic wave sensor within said enclosure, and said first and second electronic feedback loop output signals are representative of a rate of change of volume velocity to be produced by said acoustic wave actuator, and wherein said feedback loop transfer function is as follows:

$$\frac{V(s)}{P(s)} = C\frac{\omega_n^2}{s^2 + 2\zeta\omega_n s + \omega_n^2} \qquad (4)$$

where the units of $V(s)$ corresponds to said rate of change of volume velocity, $P(s)$ corresponds to the pressure at the location of said acoustic wave actuator and said acoustic wave sensor, s is a Laplace variable, ζ is a damping ratio, ω_n is said tuned natural frequency, and C is a constant representing at least one of a power amplification factor and a gain value.

40. (Original) A method for actively damping boom noise within an enclosure defining a plurality of low-frequency acoustic modes comprising the steps of:

securing a motion sensor to a panel of said enclosure, wherein said motion sensor is configured to produce a motion sensor signal representative of at least one of said plurality of low-frequency acoustic modes;

positioning an acoustic wave sensor within said enclosure, wherein said acoustic wave sensor is configured to produce an acoustic wave sensor signal representative of at least one of said plurality of low-frequency acoustic modes;

positioning an acoustic wave actuator responsive to a first electronic feedback loop output signal and a second electronic feedback loop output signal within said enclosure, wherein said acoustic wave actuator is substantially collocated with said acoustic wave sensor;

coupling a first electronic feedback loop input of a first electronic feedback loop to said acoustic wave sensor signal and a first electronic feedback loop output, wherein said first electronic feedback loop is configured to generate said first electronic feedback loop output signal by applying a feedback loop transfer function to said acoustic wave sensor signal;

coupling a second electronic feedback loop input of a second electronic feedback loop to said motion sensor signal and a second electronic feedback loop output, wherein said second electronic feedback loop is configured to generate said second electronic feedback loop output signal by applying a feedback loop transfer function to said motion sensor signal; and

operating said acoustic wave actuator in response to said first and second electronic feedback loop output signals.

41. (Original) A method for actively damping boom noise within an enclosure defining a plurality of low-frequency acoustic modes comprising the steps of:

securing a motion sensor to a panel of said enclosure, wherein said motion sensor is configured to produce a motion sensor signal representative of at least one of said plurality of low-frequency acoustic modes;

positioning an acoustic wave sensor within said enclosure, wherein said acoustic wave sensor is configured to produce an acoustic wave sensor signal representative of at least one of said plurality of low-frequency acoustic modes;

positioning an acoustic wave actuator responsive to a first electronic feedback loop output signal and a second electronic feedback loop output signal within said enclosure, wherein said acoustic wave actuator is substantially collocated with said acoustic wave sensor;

coupling a first electronic feedback loop input of a first electronic feedback loop to said acoustic wave sensor signal and a first electronic feedback loop output, wherein said first electronic feedback loop is configured to generate said first electronic feedback loop output signal by applying a feedback loop transfer function to said acoustic wave sensor signal, wherein said feedback loop transfer function comprises a second order differential equation including a first variable representing a predetermined damping ratio and a second variable representing a tuned natural frequency, said second variable representing said tuned natural frequency is selected to be tuned to a natural frequency of at least one of said plurality of low-frequency acoustic modes, said feedback loop transfer function defines a frequency response having a characteristic maximum gain substantially corresponding to the value of said tuned natural frequency, and wherein said feedback loop transfer function creates a 90 degree phase lead substantially at said tuned natural frequency;

coupling a second electronic feedback loop input of a second electronic feedback loop to said motion sensor signal and a second electronic feedback loop output, wherein said second electronic feedback loop is configured to generate said second electronic feedback loop output signal by applying said feedback loop transfer function to said motion sensor signal;

selecting a value for said first variable representing said predetermined damping ratio;

selecting a value for said second variable representing said tuned natural frequency; and

operating said acoustic wave actuator in response to said first and second electronic feedback loop output signals.

42-66. (Canceled)